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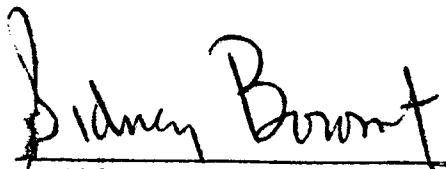
NASA GRANT NSG 699/33-16-023

ATOMIC PROCESSES IN ATMOSPHERE

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Semi-Annual Status Report

June 1, 1965 - November 30, 1965


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Principal Investigator

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The following is a summary of the work done on the subject grant from June 1, 1965 - November 30, 1965.

Experimental:

The experimental work on the scattering of electrons by atomic oxygen in the energy region 0.5 - 11.8 e.v. has been completed by Mr. Gabriel Sunshine, who was awarded his Ph.D. degree for this work. The results conform to the recent theoretical calculations by Geltman and Robinson. The cross section which is $6 \pi a_0^2$ at 0.5 e.v. rises smoothly to $9 \pi a_0^2$ at 4 e.v. and remains essentially constant thereafter. The structure in the cross section observed at the beginning of the experiment turned out to be entirely instrumental. The apparatus is now being used for the measurement of the scattering of electrons by hydrogen atoms.

Theoretical:

It has been shown that the scattering of electrons by atoms can be described by an effective range formula

$$C^2(k) k^{2L+1} \cot \delta + h(k) = a + b k^2 + \dots$$

where C and h are known functions of k and δ is the phase shift, L the angular momentum and a and b are constants. This formula is important because the constants a and b for each angular momentum state can in principle be determined from experiment and predictions

can be made as to the scattering cross sections as a function of energy. We are presently calculating the values of $C(k)$ and $h(k)$ for various different values of L and of the electric polarizability.

Investigation of the form of the phase shifts, mixing parameters and scattering amplitudes for the scattering of a charged particle by a charged polarizable target with a quadrupole moment continues. Some results have been obtained but they are not yet in a useful form. Attempts at simplification are in progress.